



Complete Summary

GUIDELINE TITLE

Use of antibiotics in adults.

BIBLIOGRAPHIC SOURCE(S)

Singapore Ministry of Health. Use of antibiotics in adults. Singapore: Singapore Ministry of Health; 2006 Feb. 180 p. [320 references]

GUIDELINE STATUS

This is the current release of the guideline.

** REGULATORY ALERT **

FDA WARNING/REGULATORY ALERT

Note from the National Guideline Clearinghouse (NGC): This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- [July 08, 2008, Fluoroquinolones \(ciprofloxacin, norfloxacin, ofloxacin, levofloxacin, moxifloxacin, gemifloxacin\)](#): A BOXED WARNING and Medication Guide are to be added to the prescribing information to strengthen existing warnings about the increased risk of developing tendinitis and tendon rupture in patients taking fluoroquinolones for systemic use.
- [September 11, 2007, Rocephin \(ceftriaxone sodium\)](#): Roche informed healthcare professionals about revisions made to the prescribing information for Rocephin to clarify the potential risk associated with concomitant use of Rocephin with calcium or calcium-containing solutions or products.

COMPLETE SUMMARY CONTENT

** REGULATORY ALERT **

SCOPE

METHODOLOGY - including Rating Scheme and Cost Analysis

RECOMMENDATIONS

EVIDENCE SUPPORTING THE RECOMMENDATIONS

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

CONTRAINDICATIONS

QUALIFYING STATEMENTS

IMPLEMENTATION OF THE GUIDELINE

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT
CATEGORIES

SCOPE

DISEASE/CONDITION(S)

- Acute upper respiratory tract infection
- Acute bronchitis and exacerbation of chronic bronchitis
- Community acquired pneumonia
- Hospital acquired pneumonia
- Acute infectious diarrhoea
- Urinary tract infection
- Acute bacterial meningitis
- Infections in the elderly

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Risk Assessment
Treatment

CLINICAL SPECIALTY

Family Practice
Gastroenterology
Geriatrics
Infectious Diseases
Internal Medicine
Pulmonary Medicine
Urology

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

- To promote the proper and appropriate use of antibiotics so as to slow the emergence of antimicrobial resistance
- To ensure that patients receive the appropriate treatment

TARGET POPULATION

Adults, including the elderly, in Singapore with infections that might need antibiotics for treatment

INTERVENTIONS AND PRACTICES CONSIDERED

Management/Treatment of Acute Upper Respiratory Tract Infection (URTI)

1. Penicillin V therapy for group A beta-haemolytic streptococcal (GABHS) pharyngitis
2. Ceftriaxone or chloramphenicol therapy for acute epiglottitis
3. Amoxicillin or penicillin therapy for acute bacterial maxillary rhinosinusitis
4. Neuraminidase inhibitors for prevention and treatment of influenza
5. Influenza vaccination

Management/Treatment of Exacerbation of Chronic Bronchitis

1. Risk stratification
2. Use of macrolides (e.g., azithromycin, clarithromycin), cephalosporins (e.g., cefuroxime), or doxycycline
3. Alternative therapy for complicated cases

Management/Treatment of Community Acquired Pneumonia

1. Risk stratification
2. Use of Fine pneumonia severity index
3. Microbiological, haematological, biochemical and serological testing
4. Chest radiograph
5. Empirical therapy for *Burkholderia pseudomallei*
6. Empirical antibiotic therapy based on risk category and relative presence of major pathogens
7. Use of oral or intravenous antibiotics

Management/Treatment of Hospital Acquired Pneumonia

Empirical antibiotic therapy based on risk factors for core pathogens, severity of illness, and duration of hospitalization

Management/Treatment of Acute Infectious Diarrhoea

1. Medical history and physical examination
2. Screening tests and stool culture
3. Rehydration and anti-motility agents
4. Empirical antibiotic therapy or specific therapy according to pathogens isolated

Management/Treatment of Urinary Tract Infection

1. History and physical examination
2. Urine analysis and urine culture if appropriate
3. Empirical antibiotic therapy or specific therapy based on results of culture and sensitivity
4. Refraining from antibiotic therapy in asymptomatic bacteriuria, except in pregnant women
5. Prophylactic therapy for recurrent infections
6. Referral to urologist as appropriate

Management/Treatment of Acute Bacterial Meningitis

1. Physical examination
2. Lumbar puncture and cerebrospinal fluid (CSF) analysis
3. Intravenous (IV) penicillin G in patients with meningococcal rash or IV ceftriaxone, or IV ceftriaxone plus ampicillin or vancomycin in patients with rash
4. Treatment modification after identifying specific pathogens
5. Adjunctive dexamethasone when appropriate
6. Chemoprophylaxis for close contacts

Use of Antibiotics in the Elderly

1. Empirical broad-spectrum antibiotic therapy (e.g., beta-lactam antibiotics)
2. Reserving aminoglycosides for selected situations only
3. Use of measures to avoid aspiration
4. Monitoring for adverse effects and drug-drug interactions
5. Systemic antibiotic therapy for pressure ulcers

MAJOR OUTCOMES CONSIDERED

- Effectiveness of antibiotic treatment
- Length of hospitalization
- Mortality
- Development and spread of antibiotic resistance
- Cost-effectiveness of antibiotic use

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Level Ia: Evidence obtained from meta-analysis of randomised controlled trials

Level Ib: Evidence obtained from at least one randomised controlled trial

Level IIa: Evidence obtained from at least one well-designed controlled study without randomisation

Level IIb: Evidence obtained from at least one other type of well-designed quasi-experimental study

Level III: Evidence obtained from well-designed nonexperimental descriptive studies, such as comparative studies, correlation studies and case studies

Level IV: Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

These guidelines on antibiotic use have been developed based on the best available evidence as well as expert opinion of the multidisciplinary workgroup in areas where studies are lacking. In addition to tailoring the evidence to suit the practice of medicine in Singapore, local microbiology patterns and resistance trends were also taken into consideration.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Grades of Recommendations

Grade A (evidence levels Ia, Ib): Requires at least one randomised controlled trial as part of the body of literature of overall good quality and consistency addressing the specific recommendation.

Grade B (evidence levels IIa, IIb, III): Requires availability of well conducted clinical studies but no randomised clinical trials on the topic of recommendation.

Grade C (evidence level IV): Requires evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality.

GPP (good practice points): Recommended best practice based on the clinical experience of the guideline development group.

COST ANALYSIS

The guideline developers reviewed published cost analyses.

Decision on when or whether to start antibiotic treatment should be based on the cost-effectiveness of the different treatment strategies. An example is illustrated in the section on recommendations for the treatment of acute rhinosinusitis. A study comparing treatment strategies for uncomplicated acute bacterial rhinosinusitis reported the cost per symptom-free day as US\$3.09 for the clinical criteria-based treatment, US\$3.95 for symptomatic treatment* and US\$184.56 for empirical treatment**. Radiographic-guided treatment was found to be more expensive and less effective than the other 3 strategies. Clinical criteria-guided treatment was shown to be the most cost-effective strategy, and treatment based on radiographic findings was shown to be more expensive and less effective.

* In which no patients were initially treated with antibiotics

** In which all patients were initially treated with amoxicillin

Appropriate antibiotic choice takes into consideration effectiveness (including the impact of antibiotic resistance and local antibiotic resistance patterns), costs and adverse effects. In cases where a range of antibiotic treatments exists, and a choice of the best antibiotic has to be made, an important consideration is cost-effectiveness. An example is in the choice of antibiotics for the treatment of acute exacerbation of chronic obstructive pulmonary disease (COPD) and chronic bronchitis. It was reported that the use of azithromycin, amoxycillin clavulanate, ciprofloxacin, cefuroxime, cefactor, cephadrine or cefprozil was the dominant strategy, being more effective as well as cheaper, compared to agents such as amoxycillin and erythromycin.

On the other hand, inappropriate or unnecessary antibiotic prescribing can be harmful to patients as well as to the community. It can cause the emergence and spread of resistant organisms, which would not only lead to clinical consequences, but also increased costs of health care. It was reported that antibiotic-resistant bacteria generated US\$4 billion to US\$5 billion in costs to the US society and individuals yearly.

There are many elements of the economic impact of antibiotic resistance. Apart from increased length of hospital stay, morbidity and mortality, there are also direct costs (e.g. diagnostic investigations, costs of administration of newer or more costly drugs), as well as indirect costs (e.g. loss of productivity of patients, costs to the drug industry resulting from diminishing marketability of their drugs).

METHOD OF GUIDELINE VALIDATION

Not stated

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not applicable

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Each recommendation is rated based on the levels of the evidence and the grades of recommendation. Definitions of the grades of the recommendations (A, B, C, Good Practice Points) and level of the evidence (Level I-Level IV) are presented at the end of the Major Recommendations field.

Principles of Antibiotic Use

GPP - Antibiotics should be used only for treatment of patients with confirmed or suspected bacterial infections. Antibiotics may be used for prophylaxis where consequences of infection would be severe. **(GPP)**

GPP - Antibiotics should only be chosen after considering the following questions:

1. Is there an infection?
2. What is the site of infection and the most likely causative organism?
3. Will the antibiotic reach the site of infection?
4. What side effects of drug interactions might this antibiotic have?
5. What adjustments should be made for the individual patient (e.g., the young infant, the elderly, patients with renal failure)?
6. What is the appropriate dose and duration of treatment for the site and type of infection? **(GPP)**

GPP - Patients or their caregivers should be clearly instructed on the dose and the necessity of finishing a course of treatment. **(GPP)**

Use of Antibiotics in Acute Upper Respiratory Tract Infections (URTI) in Adults

Antibiotic Use in URTI

B - The use of antibiotics for a large portion of URTIs is not recommended because these are viral infections, for which antibiotics do not provide clinical benefit. (Radetsky et al., 1981; Belongia et al., 2002; Gonzales et al., 2001) **(Grade B, Level IIa)**

Non-Specific Respiratory Infections

A - Antibiotic treatment of adults with non-specific upper respiratory tract infection is not recommended. (Arrol & Kenealy, 2003) (**Grade A, Level Ia**)

A - The use of antibiotics is not recommended when there is a purulent secretion from the nares or throat, in patients with uncomplicated URTI. (Kaiser et al., 1996; Heald et al., 1993; Evans, 1957; Walsh et al., 1975) (**Grade A, Level Ia**)

Acute Pharyngitis (Sore Throat)

B - Patients identified with Group A beta-haemolytic streptococcal pharyngitis should be treated with antibiotics to prevent complications. (Huovinen et al., 1989) (**Grade B, Level III**)

A - Group A beta-haemolytic streptococcal-positive patients should be treated with penicillin V for seven days. (Dagnelie, van der Graaf, & de Melker, 1996; Zwart et al., 2000) (**Grade A, Level Ib**)

A - Throat cultures are not recommended for the routine primary evaluation of adults with pharyngitis. (Dagnelie et al., 1998; Cooper et al., 2001; Dagnelie, van der Graaf, & de Melker, 1996) (**Grade A, Level Ib**)

C - Administer appropriate analgesics, antipyretics, and supportive care to all patients with pharyngitis. (McKerrow et al., 1999) (**Grade C, Level IV**)

Acute Epiglottitis

B - The antibiotic of choice to treat acute epiglottitis is ceftriaxone or chloramphenicol. (Carey, 1996) (**Grade B, Level IIb**)

Acute Rhinosinusitis

B - Sinus radiography is not recommended for diagnosis in routine cases. (**Grade B, Level IIb**)

B - Symptomatic treatment and reassurance are the preferred initial management strategy for patients with mild symptoms of acute rhinosinusitis. (Berg & Carenfelt, 1988; Williams et al., 1992; van Duijn, Brouwer, & Lamberts, 1992) (**Grade B, Level IIb**)

B - Antibiotic therapy should be reserved for:

- Patients with moderately severe symptoms who meet the criteria for the clinical diagnosis of acute bacterial rhinosinusitis (symptoms that last >7 days and include maxillary pain in the face or teeth and purulent nasal secretions); and
- Patients with severe rhinosinusitis symptoms, regardless of duration of illness. (Berg & Carenfelt, 1988; Williams et al., 1992; van Duijn, Brouwer, & Lamberts, 1992) (**Grade B, Level IIb**)

A - For the initial treatment of acute bacterial maxillary rhinosinusitis, amoxicillin or penicillin for 7-14 days is recommended. (Antimicrobial treatment guidelines

for acute bacterial rhinosinusitis, 2000; Williams et al., 2003) (**Grade A, Level Ia**)

B - Isolated infection of a frontal or sphenoid sinus is a rare but potentially dangerous condition, usually caused by bacteria, and should be referred to hospital for treatment. (Hickner et al., 2001) (**Grade B, Level IIb**)

Acute Laryngitis

GPP - If symptoms last for more than 3 weeks, the condition is classified as chronic laryngitis, for which an underlying cause must be further investigated. Underlying causes include laryngeal polyps, cancer, laryngeal tuberculosis, and gastro-esophageal reflux. (**GPP**)

B - Antibiotic treatment for acute laryngitis currently should be reserved for high-risk patients, patients with severe symptoms, or in the presence of an identifiable organism on Gram stain and culture. (Vaughan, 1982; Shah & Shapshay, 1996) (**Grade B, Level IIb**)

Acute Otitis Media

B - Antibiotics are unnecessary in acute otitis media. (Burke et al., 1991; Browning, 1990; Lisby-Sutch et al., 1990) (**Grade B, Level IIb**)

B - Avoid local treatment with antimicrobial eardrops in acute otitis media. (Lisby-Sutch et al., 1990; "Clinical uncertainty clouds pharmacoeconomic assessment of otitis media therapy," 1995) (**Grade B, Level III**)

Common Cold

A - Antibiotics should not be given for the common cold. (Rosenstein et al., 1998) (**Grade A, Level Ib**)

B - Antibiotics should not be given for the common cold which is accompanied by mucopurulent rhinitis. (Puhakka et al., 1998) (**Grade B, Level III**)

Influenza

Severe Acute Respiratory Syndrome (SARS)

A patient presenting with a fever and URTI symptoms needs to be asked for a history of recent travel within the previous 14 days from onset of symptoms, and possible contact with known SARS patients. If the history is positive for any of these, the patient must be immediately quarantined in hospital until a definitive diagnosis is clear. In SARS, the fever may temporarily improve but eventually recur, and by around day 6 of the illness, the fever may become persistently high (38 degrees C or higher). By this time, the patient will be acutely ill. A complete resolution of symptoms by day 6 is therefore a good confirmation that the patient's illness is not SARS.

A - Neuraminidase inhibitors (NIs) are effective for the prevention and treatment of influenza. (Jefferson et al., 2003) (**Grade A, Level Ia**)

B - The adamantanes, rimantadine and amantadine, are not recommended for influenza A because of increasing drug resistance. (Bright et al., 2006) (**Grade B, Level III**)

Acute Bronchitis and Exacerbation of Chronic Bronchitis

Acute Bronchitis

B - In a patient with an acute cough illness lasting less than 3 weeks, pneumonia should be ruled out by history and clinical examination. Chest X-ray for pneumonia is not necessary in the absence of red flags. (Gonzales et al., 2001; Aagaard & Gonzales, 2004; Diehr et al., 1984; Heckerling et al., 1990; Gennis et al., 1989; Singal, Hedges, & Radack, 1989; Metlay, Kapoor, & Fine, 1997) (**Grade B, Level III**)

A - Routine antibiotic treatment of acute bronchitis is not recommended, regardless of the duration of cough. (Gonzales et al., 2001; Bent et al., 1999) (**Grade A, Level Ia**)

B - Antibiotic therapy in acute bronchitis should be considered if the patient is ≥ 60 years or ill at the outset. (Macfarlane et al., 1993) (**Grade B, Level III**)

C - Once a diagnosis of acute bronchitis has been made, the physician should address symptomatic treatment and patient expectations of the visit. (Aagaard & Gonzales, 2004) (**Grade C, Level IV**)

B - All cases of acute bronchitis should be followed up and antibiotics considered if they are not recovering. (Macfarlane et al., 1993) (**Grade B, Level III**)

Acute Exacerbations of Chronic Bronchitis (AECB)

A - Patients with acute exacerbation of severity of Anthonisen Type I (having increased dyspnea, increased sputum production, and increased sputum purulence) and Anthonisen Type II (two of the three symptoms) should be given antibiotic therapy. (Anthonisen et al., 1987) (**Grade A, Level Ib**)

A - Patients with one or more of the following risk factors should be given antibiotic therapy: more than 4 exacerbations within the past year; a co-morbid condition, such as diabetes, asthma, or a history of coronary artery disease, or marked airway obstruction. (Grossman et al., 1998) (**Grade A, Level Ib**)

B - Patients with exacerbations without an increase in purulent sputum do not need antibiotic therapy unless there is a consolidation on a chest radiograph or clinical signs of pneumonia. (Stockley et al., 2000) (**Grade B, Level IIa**)

B - Patients with purulent exacerbations but who have no risk factors for treatment failure or no enhanced association with more virulent or resistant bacterial pathogens can be treated with an advanced macrolide (azithromycin,

clarithromycin), a cephalosporin (cefuroxime), or doxycycline. (Sethi & Murphy, 2004; Brunton et al., 2004; Adams & Anzueto, 2000; Martinez & Anzueto, 2005; Akalin, 2001) (**Grade B, Level IIa**)

See Table 2 in the original guideline document for classifications of patients with chronic bronchitis and antibiotic choice.

A - Patients with purulent exacerbations and who have risk factors that are associated with an increased likelihood of treatment failure or infection with more virulent or resistant organisms should be given antibiotics with enhanced antimicrobial coverage, namely the newer fluoroquinolones (moxifloxacin, gemifloxacin*, gatifloxacin, levofloxacin) (Shams & Evans, 2005; Wilson et al., 1999; Chodosh et al., 1998; Wilson et al., "A comparison of gemifloxacin," 2002; Wilson et al., "A clinical and outcomes assessment," 2002; Martinez et al., 2005) or amoxicillin-clavulanate. (Sethi, Breton, & Wynne, 2005) (Grade A, Level Ib)

* Currently not available in Singapore.

GPP - In a patient with AECB requiring repeat antibiotic therapy within 3 months, a new class of antibiotics should be used. (**GPP**)

Use of Antibiotics in Community Acquired Pneumonia (CAP)

Risk Stratification

B - Risk stratification is a key step in the management of community acquired pneumonia. (Niederman et al., 2001; British Thoracic Society Standards of Care Committee, 2001; Mandell & Niederman, 1993; Bartlett et al., 1998; Fine et al., 1997; Marrie et al., 2000) (**Grade B, Level IIa**)

Risk Categories

Category I (Low Risk: Outpatient Treatment)

Patients with clinically mild disease, and with no co-morbidly nor risk factors (see Table 4 in the original guideline document) fall in the low-risk category. They may be safely treated initially with oral antibiotics and monitored at home. They should be reviewed in the clinic within 24-48 hours to ensure that they have improved with initial treatment.

Category II (Low Risk: Consider Outpatient Treatment)

Outpatient treatment may also be considered for patients with co-morbidity or risk factors but are clinically stable. The choice of empiric antibiotics should cover the suspected pathogens such as multi-drug resistant pneumococci, Gram-negative Enterobacteriaceae or *Pseudomonas aeruginosa* (see Tables 5-8 in the original guideline document).

Category III (Intermediate Risk: Outpatient vs Hospital Ward Treatment)

Selected clinically stable patients in this category with Fine Pneumonia Severity Index (PSI) ≤ 90 may be safely managed as outpatients. Hospital admission is usually considered for elderly patients with PSI >90 and all patients who show physical and radiological signs of clinical severity (Table 7 in the original guideline document). The pathogens are similar to patients in category II but the recommended treatment should be intravenous antibiotics for most patients unless they do not show modifying risk factors (see Tables 5-8 in the original guideline document).

Category IV (High Risk: Intensive Care Treatment)

The most practical way to define severe CAP is a case that requires admission to the intensive care unit (ICU). All patients in Singapore should receive empiric treatment for *Burkholderia pseudomallei*, and those with specific risk factors should also be covered for *Pseudomonas aeruginosa* (see Tables 5-8 in the original guideline document).

B - All patients with severe community acquired pneumonia (Category IV) in the ICU should be treated empirically for *Burkholderia pseudomallei*. (Lee et al., 1996; Tan et al., 1998) (**Grade B, Level III**)

Inpatient Investigations

C - Microbiological, haematological, biochemical and serological tests (see list below) are recommended for patients in high risk categories III and IV upon presentation. (Niederman et al., 2001; British Thoracic Society Standards of Care Committee, 2001; Mandell & Niederman, 1993; Bartlett et al., 1998; Fine et al., 1997; Sanyal et al., 1999; Theerthakarai et al., 2001; Waterer & Wunderink, 2001)

The following microbiological tests should be done before starting antibiotics in patients with moderate to severe CAP (Categories III and IV). Initial microbiological studies may have limited value in the management of patients with low risk CAP (Categories I & II) (Sanyal et al., 1999; Theerthakarai et al., 2001; Waterer & Wunderink, 2001):

- Sputum Gram stain and aerobic culture (mycobacterial smear and culture where appropriate).
- Blood aerobic culture.
- Pleural fluid Gram stain and culture.
- Urine for *Legionella* antigen.

The other investigations are:

- Blood count with differentials, and smear for toxic granulations.
- Biochemistry, including renal and liver function (blood gas where necessary).
- Consider human immunodeficiency virus (HIV) testing and work-up for *Pneumocystis carinii*.
- Optional serological testing for atypical agents.

(Grade C, Level IV)

Empirical Antibiotic Therapy

A - The initial choice for empirical antibiotic therapy should be based on the risk category and relative prevalence of major pathogens. (Fine et al., 1997; Marrie et al., 2000; Gleason et al., 1999; Stahl et al., 1999; Gotfried et al., 2002; Petitpretz et al., 2001; Contopoulos-Ioannidis et al., 2001) (**Grade A, Level Ib**)

C - Quinolones are not recommended for the outpatient treatment of community acquired pneumonia in risk categories I & II. (Petitpretz et al., 2001; Mills, Oehley, & Arrol, 2005) (**Grade C, Level IV**)

See Table 8 in the original guideline document for empirical antibiotic for initial treatment of community acquired pneumonia.

A - A switch from intravenous (IV) to oral antimicrobials and prompt hospital release is recommended for patients in low or intermediate risk categories who respond promptly or become clinically stable after receiving initial antimicrobial treatment. (Omidvari et al., 1998; Ramirez et al., 1999; Ramirez & Bordan, 2001; Paladino et al., 2002; Rhew et al., 2001; Vogel, 2002) (**Grade A, Level Ia**)

Table: **B** - Criteria for discharge from hospital

- Stable vital signs for 24 hours (i.e. temperature <37.8 degrees C, respiratory rate <24/min, systolic BP \geq 90 mmHg, O₂ saturation \geq 90% while breathing room air).
- Patient able to take diet.
- Patient able to take oral antibiotics.
- No other active clinical or psycho-social problems requiring hospital stay.

(Omidvari et al., 1998; Ramirez et al., 1999; Ramirez & Bordan, 2001; Paladino et al., 2002; Rhew et al., 2001; Vogel, 2002) (**Grade B, Level III**)

B - In addition to the usual outcomes of mortality and hospital length of stay, the time to the first dose of antibiotics in elderly patients (>65 years) should be a key indicator of the evaluation of the quality of CAP management. (**Grade B, Level III**)

Use of Antibiotics in Hospital Acquired Pneumonia (HAP)

Classification of HAP and Antibiotic Use

B - It is recommended that the initial empirical therapy be based upon targeting a core group of pathogens according to severity of illness, duration of hospitalisation and risk factors for specific pathogens. (American Thoracic Society and the Infectious Disease Society of America, 2005; Chastre & Fagon, 2002; Ewig, Bauer, & Torres, 2002; Bruchhaus, McEachern, & Campbell, 1998; Mandell & Campbell, 1998; McEachern, & Campbell, 1998) (**Grade B, Level III**)

A - Piperacillin-tazobactam is as safe and effective as ceftazidime in the empirical treatment of severe hospital acquired pneumonia, hospital acquired pneumonia in

the ICU and ventilator-associated pneumonia. (Joshi et al., 1999; Alvares-Lerma et al., 2001; Brun-Buisson et al., 1998) (**Grade A, Level Ib**)

Table: **C** - Antibiotics for patients with no risk factors; hospital acquired pneumonia of mild to moderate severity, and of early onset (≤ 5 days)

Core Pathogens	Core Antibiotics
Enteric Gram-negative bacilli <ul style="list-style-type: none"> <i>Klebsiella</i> species and <i>Escherichia coli</i> 	3 rd -generation cephalosporin e.g. intravenous ceftriaxone, or beta-lactam / beta-lactamase inhibitor e.g. intravenous ampicillin-sulbactam or amoxicillin-clavulanic acid, or quinolone e.g. ciproflaxin.
Also, <ul style="list-style-type: none"> <i>Staphylococcus aureus</i> <i>Hemophilus influenzae</i> and <i>Streptococcus pneumoniae</i> 	Consider adding cloxacillin or clindamycin. Consider adding azithromycin or clarithromycin. Alternative to above: newer quinolone as monotherapy.
If MRSA* isolated $\geq 50\%$ in ICU	Consider adding vancomycin.

(**Grade C, Level IV**)

(Source: American Thoracic Society and the Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia, 2005)

*MRCA, methicillin-resistant *Staphylococcus aureus*

Table: **C** - Antibiotics for patients with no risk factors, but late onset (> 5 days) hospital acquired pneumonia, or severe hospital acquired pneumonia onset at any time (definition of severe hospital acquired pneumonia as for severe community acquired pneumonia)

Core Pathogens	Core Antibiotics
<i>Pseudomonas Aeruginosa</i>	Ciprofloxacin or amikacin <i>PLUS either</i>

Core Pathogens	Core Antibiotics
	An anti-pseudomonal beta-lactam/beta-lactamase inhibitor (piperacillin/tazobactam), <i>or</i> Ceftazidime or carbapenems (imipenem, meropenem)
Resistant <i>Acinetobacter</i> species	Anti-pseudomonal cephalosporin (ceftazidime), or imipenem/meropenem, or amikacin
MRSA*	Add vancomycin

(Grade C, Level IV)

(Source: American Thoracic Society and the Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia, 2005)

*MRCA, methicillin-resistant *Staphylococcus aureus*

Table: **C** - Risk factors for specific pathogens and antibiotics to be added

Pathogen	Risk Factor	Antibiotic
Anaerobic	Observed aspiration Abdominal surgery Putrid discharge	Clindamycin, metronidazole, or Beta-lactam/beta-lactamase inhibitor
<i>Staphylococcus aureus</i>	Coma Head injury Diabetes Renal failure	Vancomycin
MRSA*	Outbreaks	Vancomycin
<i>Legionella</i> species	Corticosteroid use Outbreaks	Erythromycin
<i>Pseudomonas aeruginosa</i>	Prolonged ICU stay Antibiotic exposure Chronic lung disease AIDS	As in severe hospital acquired pneumonia (see Table: "Antibiotics for patients with no risk factors" above)

(Grade C, Level IV)

(Source: American Thoracic Society and the Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia, 2005)

*MRCA, methicillin-resistant *Staphylococcus aureus*

Use of Antibiotics in Acute Infectious Diarrhoea in Adults

GPP - In any patient with diarrhoea, obtain the following history:

- age
- evidence of an immunocompromised state
- previous use of antibiotics
- history of travel
- scale of outbreak

(GPP)

GPP - Perform a focused physical examination in a patient with diarrhoea:

1. Look for signs of dehydration: loss of skin turgor, postural hypotension, increased pulse rate.
2. Record the temperature.
3. Examine the abdomen for tenderness or distension.
4. Perform a rectal examination to look for the presence of blood in the stool.

(GPP)

GPP - In a patient with diarrhoea, look for red flags

- Profuse, watery diarrhoea with dehydration.
- Passage of small volume stool, containing blood and mucus.
- Temperature ≥ 38.5 degrees C.
- Passage of ≥ 6 times unformed stool in 24 hours.
- Duration of illness > 72 hours.
- Severe abdominal pain, in a patient over the age of 50 years.
- Diarrhoea in the elderly (≥ 70 years of age).
- Diarrhoea in the immuno-compromised.

The presence of one or more of the above symptoms/signs suggests the diarrhoea is severe enough to warrant further evaluation and treatment. **(GPP)**

Investigations

B - The faecal leucocyte, faecal lactoferrin, or Hemocult™ test may be useful screening tests in patients with moderate to severe acute infectious diarrhoea. These tests may be used to differentiate inflammatory and non-inflammatory diarrhoeal syndromes. (Stoll et al., 1983; Siegel et al., 1987; Savola et al., 2001; Herbert, 2000) **(Grade B, Level III)**

A - Stool cultures (for salmonella, shigella and campylobacter) should be performed only in patients who have prolonged diarrhoea, or in patients who have clinical or biochemical evidence of inflammatory diarrhoea. (Stoll et al., 1983; Chan et al., 2002; Chitkara, McCasland, & Kenefic, 1996; Koplan et al., 1980) (**Grade A, Level Ib**)

A - For patients with diarrhoea that develops after three days of hospitalisation, or have recently received antibiotics or anti-neoplastics, an effort should be made to look for *Clostridium difficile* infection. (Guerrant et al., 2001; Chitkara, McCasland, & Kenefic, 1996; Rohner et al., 1997; Siegel, Edelstein, & Nachamkin, 1990) (**Grade A, Level Ib**)

C - Exposure of a traveller or hiker to untreated water and illnesses that persist for more than seven days should prompt evaluations for protozoal pathogens, especially giardia and cryptosporidium. (Thielman & Guerrant, 2004) (**Grade C, Level IV**)

GPP - Endoscopy should be reserved for the investigation of patients with persistent or chronic diarrhoea. (**GPP**)

General Management

A - Fluid and electrolyte replacement plays a pivotal role in the management of all patients with acute diarrhoea. Oral rehydration is the treatment of choice. (Guerrant et al., 2001; Dupont, 1997; Dupont, 1994; Goodman & Segreti, 1999; Ilnyckyj, 2001; Park & Giannella, 1993) (**Grade A, Level Ia**)

GPP - If an anti-motility agent is required, loperamide may be used. (Schiller et al., 1984; Dupont & Hornick, 1973) (**GPP**)

B - Anti-motility agents should not be given to patients who have febrile dysentery. (Dupont & Hornick, 1973) (**Grade B, Level IIa**)

A - Anti-motility agents should not be given to patients who have suspected *Escherichia coli* O157:H7 infection, Shiga toxin-producing *Escherichia coli* infection, or frank bloody diarrhoea. (Siegel, Edelstein, & Nachamkin, 1990; Dupont & Hornick, 1973; Cimolai et al., 1990) (**Grade A, Level Ib**)

A - In patients with moderate to severe inflammatory diarrhoea, an empirical course of quinolones can be given for 3-5 days. (Sanchez et al., 1993; Goodman et al., 1990; Dryden, Gabb, & Wright, 1996; Wistrom et al., 1992) (**Grade A, Level Ib**)

A - In patients with moderate to severe traveller's diarrhoea, an empirical course of quinolones can be given for 3-5 days. (Petrucelli et al., 1992; Chak & Banwell, 1993) (**Grade A, Level Ib**)

GPP - Elderly patients with moderate to severe diarrhoea may also be started on empirical antibiotic therapy (with quinolones). (**GPP**)

B - All patients with moderate to severe infection with shigellosis should be treated with antibiotics. Patients with mild infections in the setting of good public health and hygiene can be observed. (Weissman et al., 1974; Dupont et al., 1989) (**Grade B, Level IIa**)

A - Routine treatment with antimicrobials for patients with non-typhoid salmonellosis is not recommended. (Guerrant et al., 2001; Dupont, 1997; Dupont, 1994) (**Grade A, Level Ib**)

C - Certain patients with intestinal salmonellosis should be treated – those who have fever and systemic toxicity, those with dysentery, the elderly, and patients who are immunocompromised or immunosuppressed. (Dupont, 1997) (**Grade C, Level IV**)

B - Certain patients with proven *Campylobacter* infection should be treated with antibiotics – those who are immunocompromised, the elderly, and healthy patients with moderate to severe dysentery or with evidence suggestive of bacteraemia. (Guerrant et al., 2001; Dupont, 1997; Dupont, 1994) (**Grade B, Level IIa**)

A - Patients with enterotoxigenic *Escherichia coli* infections should be treated with antibiotics. (Dupont, 1997; Dupont, 1994; Petrucci et al., 1992; Chak & Banwell, 1993) (**Grade A, Level Ib**)

A - Patients with suspected or proven entero-haemorrhagic *Escherichia coli* (EHEC) infection, especially with *Escherichia coli* O157:H7, should not be given antibiotics. (**Grade A, Level Ib**) (Cimolai et al., 1990; Boyce, Swerdlow, & Griffin, 1995)

A - All patients with proven *Vibrio cholera* infection should be treated with antibiotics. (Khan et al., 1996; Moolasart, Eampokalap, & Supaswadikul, 1998) (**Grade A, Level Ib**)

B - Patients with mild *Clostridium difficile* infection can be treated symptomatically and with withdrawal of the offending antibiotic. (Fekety, 1997; Teasley et al., 1983) (**Grade B, Level IIa**)

A - Patients with moderate to severe *Clostridium* disease warrant prompt antibiotic treatment, with either oral metronidazole or vancomycin. (Fekety, 1997; Teasley, et al., 1983; Jobe et al., 1995) (**Grade A, Level Ib**)

Use of Antibiotics in Urinary Tract Infection (UTI)

B - It is not necessary to perform urine cultures in the management of uncomplicated cystitis in women. However, for the remainder of patients, pre-treatment cultures should be performed. ("Managing urinary tract infection in women," 1998; Urinary Tract Infection Guideline Team, 1999; O'Connor et al., 1996; Saint et al., 1999) (**Grade B, Level IIb**)

Management of Uncomplicated UTIs

A - Antibiotic therapy is not recommended in the management of patients with asymptomatic bacteriuria, except in pregnant women. (Abrutyn et al., 1994; Harding et al., 2002; Smaill, 2003) (**Grade A, Level Ib**)

A - The recommended 1st line therapy for uncomplicated cystitis in women is a 3-day course of trimethoprim-sulfamethoxazole. (Hooton et al., 1995) (**Grade A, Level Ib**)

A - Alternative treatment options for uncomplicated cystitis in women include the use of:

- Nitrofurantoin
- Fluoroquinolones
- 1st and 2nd-generation cephalosporins
- Trimethoprim
- Beta-lactam-lactamase-inhibitor combinations

(Hooton et al., 1995; Warren et al., 1999; Trienekens et al., 1989; Fihn et al., 1988; Christiaens et al., 2002; Iravani et al., 1995; McCarty et al., 1999; Saginur & Nicolle, 1992; Gupta & Stamm, 2002) (**Grade A, Level Ib**)

A - The recommended duration of treatment of uncomplicated cystitis for various agents in women is:

- For 3 days with fluoroquinolones

Or

- For 7 Days, with nitrofurantoin, 1st and 2nd-generation cephalosporins, trimethoprim or beta-lactam-lactamase inhibitor combinations. (Hooton et al., 1995; Warren et al., 1999; Trienekens et al., 1989; Christiaens et al., 2002; Iravani et al., 1995; McCarty et al., 1999; Gupta & Stamm, 2002; Iravani et al., 1999) (**Grade A, Level Ia**)

A - Single-dose regimens are not recommended for routine use in the treatment of cystitis in women, as these regimens are less effective than multi-day regimens. (Fihn et al., 1988; Saginur & Nicolle, 1992; Gupta & Stamm, 2002; Leibovici & Wysenbeek, 1991) (**Grade A, Level Ia**)

A - Women with recurrent UTI should be treated with low dose antibiotic prophylaxis, using nitrofurantoin, trimethoprim-sulfamethoxazole, trimethoprim or cephalosporins. (Brumfitt & Hamilton-Miller, 1990; Stapleton & Stamm, 1997; Pfau & Sacks, 1989; Brumfitt et al., 1992; Vahlensieck & Westenfelder, 1992; Brumfitt & Hamilton-Miller, 1998; Nicolle et al., 1989; Stapleton et al., 1990) (**Grade A, Level Ib**)

C - Initial therapy with intravenous cephalosporin and aminoglycoside, as for severe pyelonephritis, is recommended for the treatment of severe acute prostatitis. (National guideline for the management of prostatitis, 1999) (**Grade C, Level IV**)

C - Following clinical improvement, severe acute prostatitis should be treated with antibiotics, based on sensitivities, for a total duration of 4 weeks. (National guideline for the management of prostatitis, 1999) (**Grade C, Level IV**)

C - For patients with acute prostatitis of mild to moderate severity, initial therapy with oral fluoroquinolones, trimethoprim-sulfamethoxazole or trimethoprim is recommended. Treatment with antibiotics based on sensitivities should be given for a total duration of 4 weeks. (National guideline for the management of prostatitis, 1999) (**Grade C, Level IV**)

A - The recommended treatment for chronic bacterial prostatitis is fluoroquinolones for 4 weeks. (Bundrick et al., 2003) (**Grade A, Level Ib**)

B - Trimethoprim-sulfamethoxazole for 12 weeks can also be used in the treatment for chronic bacterial prostatitis. (Lipsky, 1999; Fowler, 2002) (**Grade B, Level III**)

C - For patients with recurrent chronic prostatitis, suppressive, low-dose therapy with trimethoprim-sulfamethoxazole, trimethoprim or nitrofurantoin can be administered for 6 months or longer. (Fowler, 2002) (**Grade C, Level IV**)

A - Antibiotic therapy is not indicated in the treatment of chronic prostatitis/chronic pelvic pain syndrome. (Alexander et al., 2004) (**Grade A, Level Ib**)

GPP - Patients with symptoms of chronic prostatitis, but with negative urine or prostatic fluid cultures, should be referred to a urologist for further management. (**GPP**)

Pyelonephritis

A - Treatment options for severe acute pyelonephritis include: parenteral 3rd-generation cephalosporins, aminoglycosides, fluoroquinolones, beta-lactams or beta-lactam-beta-lactamase-inhibitor combinations. Antibiotics should be modified when urine culture results become available. Oral antibiotic therapy can be started following clinical improvement, with a treatment course of 14 days. (Jimenez-Crus et al., 2002; Sanchez et al., 2002; Talan et al., 2000) (**Grade A, Level Ib**)

GPP - Initial treatment with intravenous aminoglycoside, together with a 1st or 2nd-generation cephalosporin, is recommended for hospitalized patients with acute pyelonephritis, because of the low sensitivity of hospital-acquired *Escherichia coli* to ceftriaxone and ciprofloxacin in the local context. (**GPP**)

A - Treatment options for mild acute pyelonephritis include: oral fluoroquinolones, trimethoprim-sulfamethoxazole, beta-lactams or beta-lactam-beta-lactamase-inhibitor combinations. Antibiotics should be modified when results of urine culture become available. (Jimenez-Crus et al., 2002; Sanchez et al., 2002; Talan et al., 2000; Bergeron, 1995) (**Grade A, Level Ib**)

UTI in Pregnancy

A - Asymptomatic bacteriuria in pregnancy should be treated with antibiotics, based on culture and sensitivity, to reduce the risk of pyelonephritis and other complications. (Smaill, 2003; Romero et al., 1989; Patterson & Andriole, 1997) (**Grade A, Level Ia**)

B - For acute cystitis in pregnancy, empirical therapy with 1st or 2nd-generation cephalosporins, nitrofurantoin or trimethoprim-sulfamethoxazole (caution in 3rd trimester) is recommended. Treatment should be modified based on culture results and appropriate antibiotics should be administered for 7 days. (Bergeron, 1995) (**Grade B, Level III**)

B - For pyelonephritis in pregnancy, empirical therapy with a 3rd-generation cephalosporin is recommended. Treatment should be modified based on culture results and appropriate antibiotics should be administered for 14 days. (Bergeron, 1995) (**Grade B, Level III**)

Management of Complicated UTIs

C - Antibiotic treatment of complicated urinary tract infections should be based on cultures and sensitivity. When symptoms warrant initiation of empirical therapy, cultures must be obtained prior to antibiotic therapy and therapy modified based on results. (Ronald & Harding, 1997; Nicolle, 1997; Smyth & O'Connell, 1998; Patterson & Andriole, 1997) (**Grade C, Level IV**)

C -For ill, hospitalized patients with complicated urinary tract infections, empirical treatment with intravenous 3rd-generation cephalosporins, fluoroquinolones, beta-lactams or beta-lactam-beta-lactamase-inhibitor combinations is recommended. An alternative regimen using intravenous ampicillin together with an aminoglycoside is also effective. (Stamm & Hooton, 1993; Smyth & O'Connell, 1998) (**Grade C, Level IV**)

A - For complicated urinary tract infections of mild to moderate severity, initial therapy with oral fluoroquinolones or trimethoprim-sulfamethoxazole is recommended. (Gottlieb, 1995) (**Grade A, Level Ib**)

C - For complicated urinary tract infections of mild to moderate severity, alternative regimens for empirical treatment include 2nd-generation cephalosporins, beta-lactams, or beta-lactam-beta-lactamase-inhibitor combinations. (Stamm & Hooton, 1993; Smyth & O'Connell, 1998) (**Grade C, Level IV**)

GPP - After the initiation of empirical antibiotic therapy, culture-based appropriate therapy is administered for 14 days as a minimum. (**GPP**)

GPP - Symptomatic UTIs occurring in patients with a short-term indwelling urinary catheter should be treated by removing the catheter, followed by a 7-day course of antibiotics. For patients with long-term indwelling urinary catheters, symptomatic UTIs can be treated with a 7-day course of antibiotics. (**GPP**)

GPP - In patients with renal impairment, effective antibiotics therapy requires the use of antibiotics which achieve therapeutic concentrations in the urine and are appropriately dose-adjusted for the level of renal failure. (**GPP**)

Use of Antibiotics in Acute Bacterial Meningitis in Immunocompetent Adults

Diagnosis of Acute Bacterial Meningitis

C - Initial physical examination should include evaluation for:

- level of consciousness
- cranial nerve palsies
- focal deficits
- meningismus
- increased intracranial pressure
- critical trauma

(Griffin, 1998) (**Grade C, Level IV**)

B - A lumbar puncture is recommended in all adult patients with suspected meningitis except when a clear contradiction exists. ("Bacterial meningitis," 1995; McCarron, Chaudhuri, & Todd, 1996) (**Grade B, Level III**)

Antibiotic Therapy

C - If bacterial meningitis is suspected, antibiotic treatment must be started immediately, regardless of any investigations undertaken. (Begg et al., 1999; Aronin, Peduzzi, & Quagliarello, 1998) (**Grade C, Level IV**)

B - In the treatment of meningitis with a typical meningococcal rash, intravenous penicillin G, 20 to 24 million units daily, should be given. (Tunkel, Wispelwey, & Scheld, 1990; Radetsky, 1992) (**Grade B, Level III**)

B - For adults without a typical meningococcal rash, intravenous ceftriaxone, 2 g 12 hourly, should be given. (Begg et al., 1999) (**Grade B, Level III**)

C - If the patient comes from an area where penicillin-resistant *Streptococcus pneumoniae* are common (minimum inhibitory concentration [MIC] ≥ 0.1 micrograms/ml) then add intravenous vancomycin 1 g 12 hourly. (Begg et al., 1999) (**Grade C, Level IV**)

C & GPP - For adults over the age of 50 years with a history of alcoholism, diabetes or pregnancy without a typical meningococcal rash, consider adding intravenous ampicillin, 2 g 4 hourly, to ceftriaxone as above. (Begg et al., 1999) (**Grade C, Level IV & GPP**)

C - If there is a clear history of anaphylaxis to beta-lactams, give intravenous chloramphenicol 25 mg/kg (maximum 1 g) 6 hourly. Add vancomycin, 1 g 12 hourly, because of the possibility of penicillin-resistant *Streptococcus pneumoniae*

and likely failure of chloramphenicol in this group. (Begg et al., 1999) (**Grade C, Level IV**)

B - If Gram-negative diplococci are visible on Gram stain of cerebrospinal fluid (CSF), or if *Neisseria meningitidis* is isolated from CSF or blood, continue with intravenous penicillin G, 24 million units daily. (van Deuren, Brandtzaeg, & van d Meer, 2000; Rosenstein et al., 2001) (**Grade B, Level III**)

C - For patients who do not have adequate response to penicillin, the treatment should be changed to ceftriaxone. (Quagliarello & Scheld, 1997) (**Grade C, Level IV**)

C - If penicillin-sensitive *Streptococcus pneumoniae* is isolated from CSF or blood, intravenous penicillin G 24 million units is recommended. If cephalosporin-sensitive *Streptococcus pneumoniae* is isolated, intravenous ceftriaxone 2 g 12 hourly should be given. Add on intravenous vancomycin, 1 g 12 hourly, if penicillin-resistant and cephalosporin-resistant *Streptococcus pneumoniae* is isolated from blood or CSF. Continue intravenous therapy for 10-14 days. (Quagliarello & Scheld, 1997; Kaplan & Manson, 1998) (**Grade C, Level IV**)

B - For *Haemophilus influenzae* meningitis, intravenous ceftriaxone, 2 g 12 hourly, is recommended. (Tunkel, Wispelwey, & Scheld, 1990) (**Grade B, Level IIb**)

C - If Gram-positive coccobacilli suggestive of *Listeria monocytogenes* is visible on Gram stain of CSF, or if *Listeria monocytogenes* is isolated from blood or CSF, intravenous ampicillin, 2 g 4 hourly, and gentamicin 5 mg/kg 24 hourly (single or divided 8 hourly doses) for more than 21 days is recommended. (Tunkel, Wispelwey, & Scheld, 1990; Quagliarello & Scheld, 1997) (**Grade C, Level IV**)

Table: Recommended duration of therapy according to the type of pathogen causing meningitis

Pathogen	Recommended Duration of Therapy	Grade and Level of Evidence
<i>Haemophilus influenzae</i>	7-10 days (Tunkel, Wispelwey, & Scheld, 1990; Quagliarello & Scheld, 1997)	Grade B, Level IIb
<i>Neisseria meningitidis</i>	7-10 days (van Deuren, Brandtzaeg, & van d Meer, 2000)	Grade B, Level III
<i>Streptococcus pneumoniae</i>	10-14 days (Tunkel et al., 2004)	Grade C, Level IV
<i>Listeria monocytogenes</i>	≥21 days (Tunkel et al., 2004)	Grade C, Level IV
Gram-negative bacilli, other than <i>Haemophilus influenzae</i>	21 days (Tunkel et al., 2004)	Grade C, Level IV

C - The duration of therapy should be tailored to the individual patient on the basis of the clinical and microbiological response. (Radetsky, 1990; O'Neill, 1993) (**Grade C, Level IV**)

Adjunctive Dexamethasone Therapy in Bacterial Meningitis

A - In adults with suspected or proven pneumococcal meningitis, dexamethasone 10 mg 6 hourly should be given for 4 days with the first dose administered 15-20 min before, or at least concomitant with, the first dose of antimicrobial therapy. (de Gans & van de Beek, 2002) (**Grade A, Level Ib**)

A - Dexamethasone should only be continued if the CSF Gram stain reveals Gram-positive diplococci or if blood or CSF cultures are positive for *Streptococcus pneumoniae*. (de Gans & van de Beek, 2002) (**Grade A, Level Ib**)

A - Adjunctive dexamethasone should not be given to adult patients who have already received antimicrobial therapy as in this circumstance, dexamethasone is unlikely to improve patient outcome. (de Gans & van de Beek, 2002) (**Grade A, Level Ib**)

Prevention of Meningococcal Meningitis

C - Chemoprophylaxis should be offered to close contacts of cases, irrespective of vaccination status, in those who have:

- Prolonged close contact with the case in a household setting during the seven days before onset of illness.
- Contact at a child-care centre.
- Transient close contact with a case where there was exposure to the patient's secretions (e.g. through kissing, mouth-to-mouth resuscitation, endotracheal intubation or endotracheal tube management) around the time of admission to hospital.

("Control and prevention of serogroup C meningococcal disease: evaluation and management of suspected outbreaks: recommendations of the Advisory Committee on Immunization Practices [ACIP]", 1997; Bilukha & Rosenstein, 2005) (**Grade C, Level IV**)

C - Close contacts of patients with meningococcal infection should receive one of the following regimens:

- Rifampicin:

Adults: 600 mg, 12 hourly for 2 days (4 doses).

Children (1-6 years): 10 mg/kg, 12 hourly for 2 days (4 doses).

Children (3-11 months): 5 mg/kg 12 hourly for 2 days (4 doses).

- Ciprofloxacin:

Adults: 500 mg as a single dose.

Children: Use of ciprofloxacin is not recommended.

- Ceftriaxone:

Adults: 250 mg as a single intramuscular dose.

Children (<15 years): 125 mg as a single intramuscular dose.

(Bilukha & Rosenstein, 2005; Dworzack et al., 1988; Schwartz et al., 1988)
(**Grade C, Level IV**)

C - If other antibiotics have been used for treatment, the index patient should receive prophylactic antibiotics for eradication of nasopharyngeal carriage before being discharged from hospital. (Abramson & Spika, 1985) (**Grade C, Level IV**)

Use of Antibiotics in the Elderly

Unique Aspects of Infections in Older People

B - An infectious aetiology should be sought when there is:

- A change in functional status and the oral temperature is ≥ 37.2 degrees C, or
- An increase in temperature of ≥ 1.3 degrees C over the baseline.

(Norman, 2000) (**Grade B, Level III**)

C - Infection should be considered in the differential diagnosis of older people who present, within a short period of time:

- With only non-specific symptoms, including functional decline; or
- With atypical complaints.

(Yoshikawa, 1994) (**Grade C, Level IV**)

C - Doctors should be alert to a leucocytosis with left shift or left shift alone, as these have good predictive value for diagnosing bacterial infections in older people.

(Keating et al., 1984) (**Grade C, Level IV**)

Treatment Recommendations

C - Empirical antibiotic therapy for specific infections is a valid and practical option in older persons, given the higher risk of adverse outcomes, diverse infectious causes and increased difficulty in obtaining diagnostic specimens. In general, this therapy should include a broad-spectrum beta-lactam antibiotic. (**Grade C, Level IV**)

C - When culture results are not available yet, the choice of antibiotic should be guided by knowledge of the likely pathogens encountered in older people in different settings. (**Grade C, Level IV**)

C - Aminoglycosides should be reserved for selected situations: septic shock without a specific aetiological diagnosis, confirmed or suspected *Pseudomonas aeruginosa* infections, or where the cultured organism is only susceptible to an aminoglycoside. (**Grade C, Level IV**)

C - The patient's renal function should always be considered when prescribing antibiotics in older people, particularly if the antibiotics are excreted primarily by the kidneys (e.g. aminoglycosides, fluoroquinolones, and some cephalosporins such as ceftazidime). Estimated creatinine clearance should be used to guide appropriate dosing of such antibiotics. (Rajagopalan & Yoshikawa, 2001) (**Grade C, Level IV**)

C - There should be monitoring for adverse effects of antibiotics during therapy. In addition to specific adverse effects, geriatric syndromes or functional decline should also be considered as possible adverse effects of antibiotics. (**Grade C, Level IV**)

Additional Antibiotic Consideration in the Elderly

GPP - Awareness of potential drug-drug interactions should guide the choice of antibiotics. (**GPP**)

C - Assistance from caregivers who can help administer medications should be sought where necessary. Keeping the antibiotic regimen as simple as possible is also useful in improving compliance. (Stalam & Kaye, 2004) (**Grade C, Level IV**)

Special Situations in the Elderly

C - The choice of antibiotic is usually guided by the likely spectrum of bacterial flora that might be encountered. Broad-spectrum antibiotics that include Gram-negative cover are usually required. For pneumonia in the setting of long-term care institutions, antibiotic cover for anaerobes (e.g. amoxicillin-clavulanate) should be considered if aspiration is a concern. (Torres et al., 1999)

(**Grade C, Level IV**)

The following measures to prevent aspiration are recommended:

C - Reduce the risk of aspiration by:

- Avoiding sedative medication
- Minimising the use of nasogastric tubes
- Elevating the head of bed during and after feeding

(Cantrell & Norman, 1998; Finegold, 1995) (**Grade C, Level IV**)

C - Timely assessment of swallowing, at the bedside or by a speech therapist, can be useful in guiding any modification of feeding (e.g. consistency of fluids). (Cantrell & Norman, 1998) (**Grade C, Level IV**)

C - There should be proper treatment of periodontal disease and gingivitis. (Finegold, 1995)

(Grade C, Level IV)

C - In treating aspiration pneumonia, use antibiotics that include broad-spectrum ones with anaerobic cover (such as amoxicillin-clavulanate), or the combination of a fluoroquinolone with either metronidazole or clindamycin. (Leroy et al., 1997)
(Grade C, Level IV)

C - Patients with asymptomatic bacteriuria while on intermittent catheterisation should not be treated with antibiotics. (Stalam & Kaye, 2000) The exception is the presence of possible "atypical presentation" of infection. **(Grade C, Level IV)**

C - Systemic antibiotics should be used with more serious pressure ulcer infections, including those with spreading cellulitis, osteomyelitis and bacteraemia. (Livesley & Chow, 2002) **(Grade C, Level IV)**

C - Empirical antibiotics that are effective against Gram-positive and Gram-negative organisms as well as anaerobic organisms are needed. Monotherapy with piperacillin-tazobactam or a carbapenem, or combination therapy employing ciprofloxacin with either metronidazole or clindamycin are useful options. (Stalam & Kaye, 2000; Livesley & Chow, 2002) As tissue perfusion is usually poor in infected ulcers, intravenous antibiotic therapy should be administered initially. (Livesley & Chow, 2002) **(Grade C, Level IV)**

Definitions:

Grades of Recommendations

Grade A (evidence levels Ia, Ib): Requires at least one randomised controlled trial as part of the body of literature of overall good quality and consistency addressing the specific recommendation.

Grade B (evidence levels IIa, IIb, III): Requires availability of well conducted clinical studies but no randomised clinical trials on the topic of recommendation.

Grade C (evidence level IV): Requires evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality.

GPP (good practice points): Recommended best practice based on the clinical experience of the guideline development group.

Levels of Evidence

Level Ia: Evidence obtained from meta-analysis of randomised controlled trials

Level Ib: Evidence obtained from at least one randomised controlled trial

Level IIa: Evidence obtained from at least one well-designed controlled study without randomisation

Level IIb: Evidence obtained from at least one other type of well-designed quasi-experimental study

Level III: Evidence obtained from well-designed nonexperimental descriptive studies, such as comparative studies, correlation studies and case studies

Level IV: Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities

CLINICAL ALGORITHM(S)

Clinical algorithms are provided in the original guideline document for:

- Risk-Stratification Approach to Antibacterial Therapy of Acute Exacerbation of Chronic Bronchitis
- Management of Community Acquired Pneumonia
- Management of Acute Diarrhoea
- Approach to Management of Urinary Tract Infections in Adults
- Initial Management of a Patient with Acute Meningitis

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations")

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate use of antibiotics and appropriate treatment of patients

POTENTIAL HARMS

- Local treatment with antimicrobial eardrops should generally be avoided in acute otitis media as there is a possibility of ototoxic adverse effects. They also contribute to the development of antibiotic resistance.
- Adverse effects of antibiotic therapy, including drug-drug interactions. These effects are most problematic in the elderly who are taking multiple medications.

CONTRAINDICATIONS

CONTRAINDICATIONS

- Contradictions to lumbar puncture include presence of signs of raised intracranial pressure or focal neurological signs unless there is a normal brain computerised tomographic (CT) scan. Other contradictions include severe shock, severely depressed or fluctuating consciousness level or coagulation disorder.
- Anti-motility agents (e.g., loperamide) should not be given to patients who have febrile dysentery, patients with suspected *Escherichia coli* 0157:H7 infection, or to patients under 2 years of age
- Sulphonamides should be avoided in the third semester of pregnancy.
- Fluoroquinolones are best avoided in pregnancy.
- Gentamicin is best avoided in patients with underlying renal disease.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These guidelines are not intended to serve as a standard of medical care. Standards of medical care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge advances and patterns of care evolve.
- The contents of this publication are guidelines to clinical practice, based on the best available evidence at the time of development. Adherence to these guidelines may not ensure a successful outcome in every case. These guidelines should neither be construed as including all proper methods of care, nor exclude other acceptable methods of care. Each physician is ultimately responsible for the management of his/her unique patient in the light of the clinical data presented by the patient and the diagnostic and treatment options available.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

The following indicators for community acquired pneumonia are proposed:

- Antibiotic timing: percentage of pneumonia patients who received first dose of antibiotics within 4 hours after hospital arrival
- Initial antibiotic consistent with current recommendations

IMPLEMENTATION TOOLS

Audit Criteria/Indicators
Clinical Algorithm
Personal Digital Assistant (PDA) Downloads
Quick Reference Guides/Physician Guides

Slide Presentation
Staff Training/Competency Material

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Singapore Ministry of Health. Use of antibiotics in adults. Singapore: Singapore Ministry of Health; 2006 Feb. 180 p. [320 references]

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Not applicable: The guideline was not adapted from another source.

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [Singapore Ministry of Health Web site](#).

Print copies: Available from the Singapore Ministry of Health, College of Medicine Building, Mezzanine Floor 16 College Rd, Singapore 169854.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Use of antibiotics in adults, slides & speeches. Mar 2006. Available from the [Singapore Ministry of Health Web site](#).

The following is also available:

- Audit criteria and a continuing medical education (CME) self assessment are available in the [original guideline document](#).
- The full text guideline and summary card are available for PDA download in ISilo and MSReader formats from the [Singapore Ministry of Health Web site](#).

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on July 25, 2006. This summary was updated by ECRI Institute on October 3, 2007 following the U.S. Food and Drug

Administration (FDA) advisory on Rocephin (ceftriaxone sodium). This summary was updated by ECRI Institute on July 28, 2008 following the U.S. Food and Drug Administration advisory on fluoroquinolone antimicrobial drugs.

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